PTO 08-0804

CC=JP DATE=19840106 KIND=A
PN=59001583

COMPOSITE SYNTHETIC RESIN FILM ADHESIVE TAPE
[Goseijushi fukugo firumu no nenchaku tepu]

Yoshiro Sato, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. November 2007

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19):	JP
DOCUMENT KIND	(12):	A
	(13):	PUBLISHED UNEXAMINED PATENT APPLICATION (Kokai)
PUBLICATION DATE	(43):	19840106 [WITHOUT GRANT]
PUBLICATION DATE	(45):	19840106 [WITH GRANT]
APPLICATION NUMBER	(21):	59-001583
APPLICATION DATE	(22):	19820629
PRIORITY DATE	(32):	
ADDITION TO	(61):	
INTERNATIONAL CLASSIFICATION	(51):	C09J 7/02
DOMESTIC CLASSIFICATION	(52):	
PRIORITY COUNTRY	(33):	
PRIORITY NUMBER	(31):	
PRIORITY DATE		(32):

INVENTOR	(72):	SATO, YOSHIRO; HARADA, TAKENORI; MIYAGI, YASURO
APPLICANT	(71):	ASAHI CHEM IND CO LTD SEMEDAIN KK SANEE KAGAKU KOGYO KK.

TITLE	(54):	COMPOSITE SYNTHETIC RESIN FILM ADHESIVE TAPE
FOREIGN TITLE	[54A]:	Goseijushi fukugo firumu no nenchaku tepu

Specification /615*

1. Name of this Invention

Composite Synthetic Resin Film Adhesive Tape

2. Claim(s)

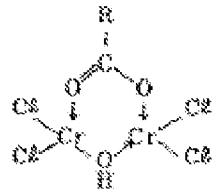
[Claim 1] Composite synthetic resin film adhesive tape prepared by

laminating a polystyrene type film and low density polyethylene type film,

providing corona electrical discharging to at least the low density polyethylene film side,

coating a hot-melt type adhesive over one side of complex film, and

coating one kind or a mixture of chromium complex salts expressed as the following formula to the other side of the surface for an amount of 15 - 100 mg/m^2 (in solid) as a separation agent, wherein the unwinding force of the tape measured according to JIS-Z-1522 is 80 - 400 g/10 mm:



(where R denotes an alkyl group having 14 - 18 carbons.)

* Numbers in the margin indicate pagination in the foreign text.

3. Detailed explanation of this invention

[Field of the Invention]

This invention pertains to an adhesive tape consisting of composite synthetic resin films having improved electrification property when an appropriate unwinding force is applied.

[Description of the Prior Art]

As conventional adhesive tapes, cellophane adhesive tape is most well known and used for various purposes.

However, a cellophane adhesive tape is easily affected by moisture. For example, when moisture is lost during drying, the tape causes frequent tearing in oblique direction or in sideways. On the other hand, when a large amount of moisture is absorbed, the tape is stretched to cause a telescoping phenomenon (surface similar to the surface of bamboo shoot) or separation of adhesive layer.

[Summary of this invention]

The developers of this invention thoroughly researched for solving the problems of the abovementioned cellophane adhesive tape by utilizing a synthetic resin film which was free from the moisture effect. As a result, they found that, by utilizing a composite film prepared by laminating a polystyrene type film to a low density /616 polyethylene type film, the prepared synthetic resin adhesive tape could provide transparency, and excellent manual tearability in a crosswise direction, combined with the flexibility and texture of cellophane adhesive tape.

[Problems to be Solved by this Invention]

On the other hand, although the abovementioned adhesive tape consisting of a composite synthetic resin film certainly satisfies various conditions, such as transparency, manual tearability in a crosswise direction, flexibility, texture, etc., required for adhesive tape equivalent to or better than those of cellophane tape, a problem still remains in the area of antistatic properties when an appropriate unwinding force is applied to the tape.

According to the experiments based on the JIS-Z-1522 measurement conducted by the developers of this invention, the unwinding force of adhesive tape of said composite synthetic resin film exceeding 400 g/10 mm makes the adhesive tape curl significantly toward the stress side during unwinding. Therefore, the unwinding force exceeding this value becomes a minus factor. However, the unwinding force less than 80 g/10 mm results in an amount of unwinding exceeding the intended unwinding amount when the tape is cut with an adhesive tape dispenser or unwound at a high speed (30 m/min - 70 m/min), thereby making it difficult to cut the tape for a needed length. However, when a certain degree of unwinding force is applied to the adhesive tape of said composite synthetic resin film, not only does the synthetic resin film itself create static relatively easily, but also, significant electrification is created to the adhesive tape by the effect of separation at the time of unwinding due to the use of styrene type film having a characteristic of electrification higher

than other synthetic resin films. As a result, inconvenient problems, such as mutual adhesion of cut adhesive tapes, soiling of adhesive surface by attracting dusts, etc., would occur.

In order to solve this electrification problem, adding an antistatic agent in the utilizing synthetic resin, adhesive agent, and separation agent can be considered. However, since the addable amount of antistatic agent is limited, it is difficult to provide fundamental solution to the problem of electrification if an antistatic agent is merely added.

On the other hand, generally, silicone is widely used as a separation agent for an adhesive tape. However, in some special cases, it is known that chromium complex salt can be used as a separation agent for a cloth adhesive tape (refer to JP-B (Tokko) S57-15774).

This chromium complex salt which was originally used as a water-repellent agent for cloth is utilized for the abovementioned cloth adhesive tape by focusing on the point of base material commonality that both of them are cloths. Thereby, this type of chromium complex salt was never used as a separation agent for an adhesive tape consisting of a synthetic resin film which is completely different from a cloth base material. Moreover, the main material of a cloth adhesive tape is a woven cloth, staple fiber fabric, etc. which does not have any possibility of electrification, and moreover, it is extremely thick and has a large unit weight. Therefore,

consideration for the preventing static effect during unwinding the cloth adhesive tape is almost unnecessary.

[Purpose of this Invention]

The purpose of this invention is to improve the antistatic properties of adhesive tape consisting of a composite synthetic resin film which was developed by the developers of this invention for solving the problems of the cellophane adhesive tape so as to provide improved handlability. Particularly, this invention was completed based on the discovery that, by coating a chromium complex salt over the surface of a tape as a separation agent, the tape surface became almost static-free even when a certain amount of unwinding force suitable for handling the tape was applied.

[Constitution of this Invention]

Hereafter, this invention is further explained in detail.

First, the following explains the composite synthetic resin film which is the base of an adhesive tape of this invention. As described above, this complex film is prepared by laminating a polystyrene type film and a low density polyethylene type film.

In this case, the polystyrene type film is a biaxially extended film of polystyrene by itself or of polystyrene and other added materials, such as butadiene, acrylonitrile, a butadiene-acrylonitrile copolymer, a styrene-butadiene-styrene copolymer, etc. Moreover, the low density polyethylene type film is a copolymer film containing a single ethylene polymer or ethylene as its main

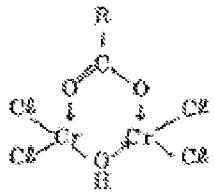
ingredient, which may be a copolymer film copolymerized with vinyl acetate, acrylic acid, etc. or an activated polyethylene film. Without saying that the polystyrene type film and the low density polyethylene type film can contain an antistatic agent, a coloring agent, an ultraviolet ray absorption agent, etc. Films may be laminated by an extrusion coating method which coats a low density polyethylene type synthetic resin over a polystyrene type film with pressure, or they may be laminated by adhering a low density /617 polyethylene type film using a dry-laminating method.

Particularly, by preparing the abovementioned composite film under the following conditions, the film can be made into a suitable adhesive tape base body having transparency, excellent manual tearability in a crosswise direction, and flexibility/texture of cellophane. That is, excellent properties of adhesive tape base can be obtained by preparing the film under the following condition: When the extension scaling factor in a crosswise direction is expressed as λTD and the extension scaling factor in a lengthwise direction is expressed as λMD, $4 \leq \lambda TD < \lambda MD$ and $\lambda MD \geq 1.2\ \lambda TD$; when the thickness of polystyrene type film is expressed as t, the thickness of low density polyethylene type film = 0.8 t - 1.5 t; and total film thickness = 30 μ - 60 μ.

However, even when a composite film having excellent properties is prepared into an adhesive tape base body by satisfying the abovementioned conditions, if the tape causes high electrification at

the time of unwinding, or an extremely small unwinding force is provided for avoiding the static problem, the practicality of an adhesive tape is lost. Particularly, this invention solves these problems by coating chromium complex salt as a separation agent.

The chromium salt used in this invention is a compound expressed as the following formula:



(where R denotes an alkyl group having 14 - 18 carbons.)

If the number of carbons shown as R is 13 or below, as intended orientation cannot be obtained by coating, separation effect cannot be distributed uniformly to the entire surface. On the other hand, a material expressed as R having 19 or higher carbon number is hard to obtain.

In this invention, one kind of abovementioned chromium complex salt or a mixture of two or more kinds of chromium complex salts is coated over one side of composite synthetic resin film as a separation agent. For providing this coating, chromium complex salt can be coated as an alcohol type solution (e.g., isopropanol) and dried. During the drying process, heat which is moderate enough for avoiding any damage to the film may be applied to help the gaseous dispersion of the solvent.

The coating amount of chromium complex salt should be 15 - 100 mg/m^2, preferably 20 - 40 mg/m^2. If the coating amount is too small, not only does the required separation effect become unobtainable, but also, the tape easily causes static at the time of unwinding. On the other hand, as an excessive amount of coating makes the separation agent layer too thick, the separation agent layer itself becomes falls off easily.

The adhesive used in this invention is a hot-melt type adhesive agent which must provide unwinding force according to JIS Z-1522 of 80 - 400 g/10 mm, preferably 150 - 350 g/10 mm for the abovementioned separation agent. The reason for requiring the hot-melt type adhesive agent is that a regular solvent type adhesive particularly easily causes damages to a polystyrene type film. This is because, when this solvent type adhesive agent is coated over the surface of low density polyethylene type film, the solvent permeates through pin-hole-like small holes which are hardly preventable during the production of a low density polyethylene type film, and reaches to the polystyrene type film, subsequently causing significant curling of composite film used as a base material. Moreover, the reason for requiring an unwinding force of 80 - 400 g/10 mm, preferably 150 - 350 g/10 mm is that if the unwinding force is too small, although possibility of static problem occurrence can be reduced, an extra portion of the tape is unwound at the time of high speed unwinding, whereas if the unwinding force is excessive, the unwinding process

itself becomes difficult, or such excessive force becomes the source for causing curling of unwound tape.

As for obtaining the hot-melt type adhesive, 40 - 200 wt. parts of adhesivenss donor and 10 - 100 wt. parts of plasticizer were added to 100 wt. parts of thermoplastic elastomer, to which appropriate amounts of other additives, such as an aging prevention agent, an ultraviolet ray absorbent, a filler, and the like, are added. If the amount of plasticizer is less than 10 wt. parts, the coating temperature becomes higher than the heat resistance temperature of styrene type film, whereas an amount exceeding 100 wt. parts becomes the source for causing telescoping or jutting-out of adhesive agent. If the amount of adhesiveness donor is less than 40 wt. parts, the needed unwinding force cannot be obtained, whereas an amount exceeding 200 wt. parts worsens the cold resistance.

The thermoplastic elastomer may be a single material or a mixture of two or more materials selected from styrene-isoprene-styrene block copolymer, styrene-ethylene-styrene block copolymer, /618 etc., or they may be said materials also containing other synthetic rubber, polyolefin, or polyolefin type copolymer.

As the adhesiveness donor, natural resins, such as rhodine, polymerized rhodine, water-added rhodine, rhodine ester, and the like, modification of those materials, aliphatic, cyclic, or aromatic petroleum resin, Terpene resin, Terpene phenol resin, chroman resin, etc., are used.

Examples of softening agent are processed oil, paraffin oil, caster oil, polybutene, polyisoprene, and the like.

The abovementioned separation agent and adhesive may be provided to either the polystyrene type film side of composite film or low density polyethylene type film side of composite film. However, corona discharge treatment must be provided to at least the surface of low density polyethylene type film. When the separation agent and adhesive are coated, unless the corona discharge treatment is provided, the adhesiveness becomes insufficient to cause those agents to fall easily.

If the corona discharge treatment is applied not only to the low density polyethylene type film side, but also to the polystyrene type film side, the more preferable result can be obtained.

Operational example 1:

A 20 μ thick low density polyethylene layer was laminated over a bi-axially extended 20 μ thick polystyrene film produced under the condition of lengthwise extension scale factor of 7.8 times and sidewise extension scale factor of 6 times for preparing a complex film. Using this film as a base body, corona discharge treatment was applied to the low density polyethylene film side. Then, a separation agent was coated over this low density polyethylene film side, while an adhesive agent was coated over the polystyrene film side.

As a separation agent, Quilon (Dupont, USA) was used. As the adhesive agent, a material consisting of the following compositions was used:

Styrene-isoprene-styrene block copolymer (Kaliflex TR1107, product of Shell Chemical)	10 wt. parts
Mineral oil (Shelflex 371N, product of Shell Chemical)	35 wt. parts
Petroleum resin (Arcon P100, product of Arakawa Kagaku Kogyo)	100 wt. parts
Phenol type aging prevention agent (Irganox 1010J, product of Chibaguigy)	3 wt. parts
Ultraviolet ray absorbent (Chinupin 526, product of Chibaguigy)	1 wt. part

The unwinding force of the obtained adhesive tape was 500 g/10 mm according to JIS-Z-1522 measurement. Electrification to the adhesive tape hardly occurred during unwinding.

Comparison example 1:

Using the same complex film described in the operational example 1 as a base body, a corona discharge treatment was applied to the low density polyethylene film side as did in the operational example 1. Also, an ultraviolet ray hardening type silicone was applied to this polyethylene film side as a separation agent, whereas an adhesive agent prepared to provide the unwinding force of 300 g/10 mm by adjusting the composition amount of the same mixed product used by the operational example 1 was applied to the polystyrene film side. Moreover, as the hardening condition of the ultraviolet ray hardening type silicone, an ultraviolet ray ramp was used to provide the irradiation of 160 W/1 cm width length at a 20 m/mm feeding speed.

The obtained adhesive tape caused a large amount of static at the time of unwinding and was significantly low in handlability.

Comparison example 2:

Using the same complex film as described in the operational example 1 as a base body, the following solvent type adhesive agent was coated.

Natural rubber [ML1+4 (60)]	100 wt. parts
Polybutene	10 " "
Water-added rhodine ester	100 " "
BHT	4 " "
n-hexane	Appropriate amount

As a result, even if the abovementioned adhesive agent was coated over the low density polyethylene film side or polystyrene type film side, the obtained adhesive tape curled in the width direction. Thereby, before considering the electrorification property and the like, the obtained adhesive tape failed to provide satisfactory handlability. /619